Steam rocket

A **steam rocket** (also known as a **hot water rocket**) is a thermal rocket that uses water held in a pressure vessel at a high temperature, such that its saturated vapor pressure is significantly greater than ambient pressure. The water is allowed to escape as steam through a rocket nozzle to produce thrust.[1]

Steam rockets are usually pressure fed, but more complex designs using solar energy or nuclear energy have been proposed. They are probably best known for their use in rocket-powered cars and motorcycles, and they are the type used in aeolipile.

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Principle of operation

Water, while under pressure, is heated up to a high temperature (approx. 250-500 °C). As the hot water goes through the nozzle (usually a de Laval nozzle) and the pressure reduces, the water flashes to steam pressing on the nozzle, and leaving at high speed. By the recoil the rocket accelerates in the opposite direction to the steam. The nozzle of hot water rockets must be able to withstand high pressure, high temperatures and the particularly corrosive nature of hot water.

The simplest design has a pressurised water tank where the water is heated before launch, however, this gives a very low exhaust velocity since the high latent heat of vapourisation means that very little actual steam is produced and the exhaust consists mostly of water, or if high temperatures and pressures are used, then the tank is very heavy.

More complex designs can involve passing the water through pumps and heat exchangers and employing nuclear reactors or solar heating, it is estimated that these can give a specific impulse of over 195 s I_{sp},[2], which is still well below the standards of more complex designs, for example the 465 s of the hydrogen-oxygen Vinci engine.

Applications of steam rockets

- An aeolipile is pushed around by steam rockets

- Evel Knievel's Skycycle X-2 used for the Snake River Canyon jump used a steam rocket designed by Robert Truax
- Walt Arfons's "Neptune I" dragster, also used a steam rocket designed by Robert Truax[3]
- Hot water rockets are used occasionally as auxiliary launch aids and for experimentation purposes..
- On March 25, 2018 flat-Earther "Mad" Mike Hughes manned and launched his steam powered rocket to a height of 1,875 feet (572 m).[4]

Proposed uses of steam rockets

Solar or nuclear heated steam thermal rockets have been proposed for use in interplanetary travel. Although the performance is low, high mass fractions are easy to achieve, and water is expected to be very easy to extract and purify from ice deposits that are found around the solar system.[5]

See also

- Walter HWK 109-500 and Walter HWK 109-507, German WW II rocket boosters whose T-Stoff monopropellant fuel exhausted from them as superheated steam
- Nuclear salt-water rocket
- Water rocket
- Rocket engine
- Jet engine

References

1. tecaeromex- steam rockets (http://www.tecaeromex.com/ingles/vapori.html)
2. AIAA 97-3172, "Nuclear-Heated Steam Rocket Using Lunar Ice" (http://www.neofuel.com/moonicerocket/) Anthony Zuppero
3. "Neptune I" (http://www.tecaeromex.com/ingles/vapori.html)
4. Chiara Giordano (25 March 2018). "Flat-earther blasts off in homemade rocket in bid to reassure himself world is shaped 'like a Frisbee' " (https://www.independent.co.uk/news/world/americas/flat-earther-mad-mike-hughes-rocket-launch-man-blasts-off-a8272761.html). The Independent. Retrieved 25 March 2018.
5. Neofuel, using abundant off-earth resources for interplanetary transport (http://www.neofuel.com/)

Popular culture

Steam rocket have occasionally appeared in science fiction stories, especially steampunk.

- Steamboy

External links

- Steam Rockets of Tecnologia Aeroespacial Mexicana (http://www.tecaeromex.com/ingles/vapori.html)
- Time article about possible applications (http://www.time.com/time/magazine/article/0,9171,866799,00.html)

- Aquarius (http://www.aquarius-aerospace.de) Hot Water Rocket Propulsion Systems site
- Technical papers (http://www.canosoarus.com/10X1Skycycle/Skycycle04.htm) ordering

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